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NWS Chicago Sponsors Second Annual Aviation Weather Workshop

By Patty Wontroba, Aviation Services Improvement Meteorologist

On Friday and Saturday, February 25 and 26, the National Weather Service Chicago Forecast Office, located in Romeoville, IL, sponsored its second annual Aviation Weather Workshop. Lewis University generously served as host. Local Federal Aviation Administration facilities and the Chicago Department of Aviation co-sponsored the event. Representatives from several NWS offices, national centers and Headquarters led discussions, as did people from Chicago Air Route Traffic Control Center, Chicago Terminal Radar Approach Control, O'Hare International Airport tower, the City of Chicago, United Airlines and Southwest Airlines.

Mark Ratzer and Mike Bardou lead a discussion on the meteorology of a December 2010 snow event.

Each day of the workshop had a unique focus. The first day was concentrated on commercial and aviation industry interests, with a particular focus on methods of reducing unanticipated weather-related air traffic delays. A snow event from December, 2010 was chosen as a case study. Speakers from the NWS, FAA, Chicago Department of Aviation, United Airlines and Southwest Airlines gave insights into how the weather had impacted their operations on that day, followed by discussion. It was a valuable learning experience for all, and a rare opportunity to have so many partners together at one time. As the afternoon turned to more technical meteorological topics on recent NWS developments and future plans, NWS Chicago MIC Ed Fenelon led a tour of the WFO for some of the FAA and airline attendees.

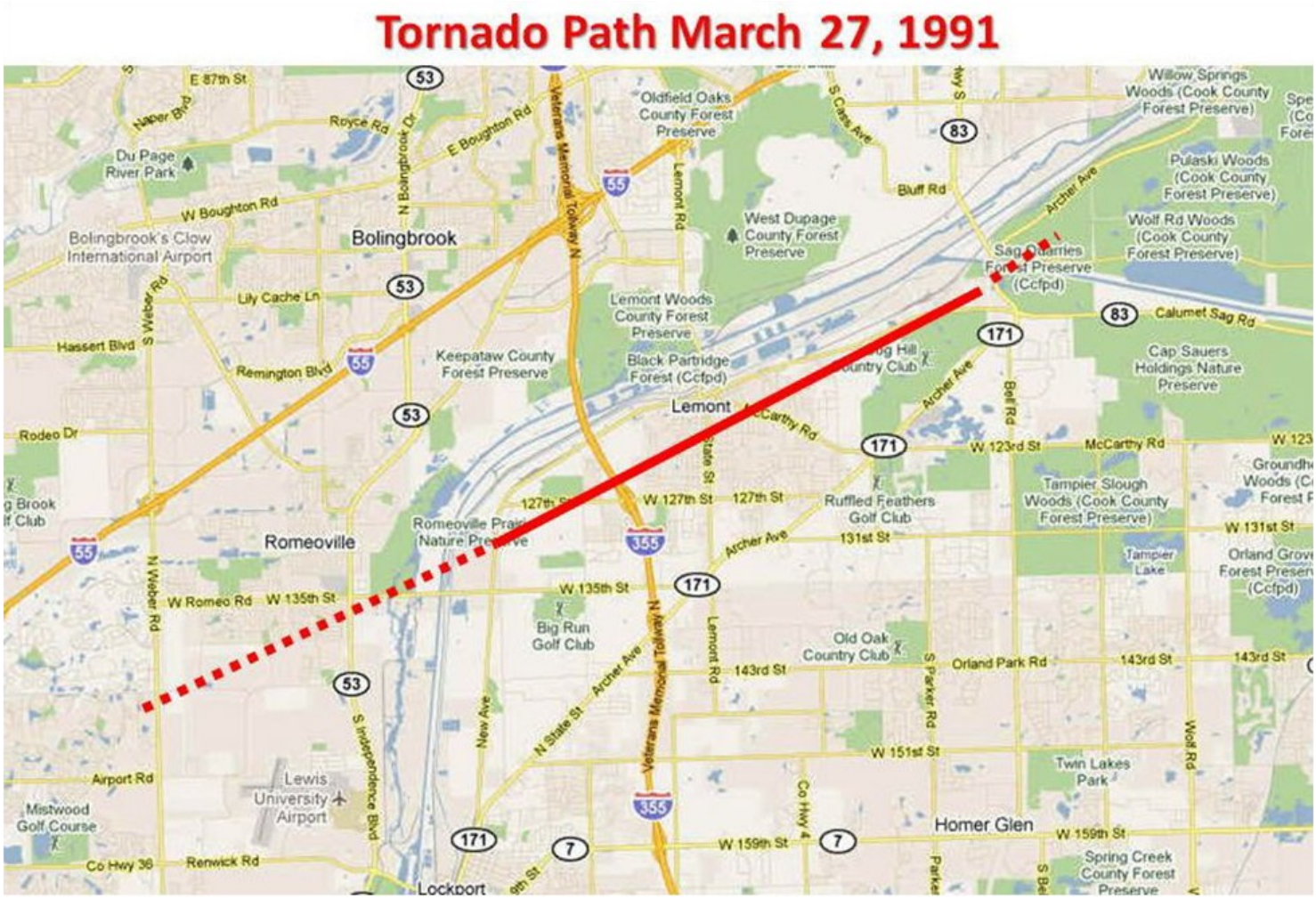
The second day of the conference was concentrated on general aviation interests and education. Attendance served as a credit towards the FAA Safety Team's WINGs Pilot Proficiency Program. A crowd of about 100 pilots, air traffic controllers, dispatchers and others associated with aviation attended, despite intermittent light snow and drizzle with IFR conditions throughout the day which prevented fly-ins. Topics on Saturday included: using the Aviation Digital Data Service, accessing the NWS' National Digital Forecast Database, introduction to Dual-Polarization Doppler Radar imagery, interpretation of satellite imagery, icing, lake-effect snow, atmospheric stability, and the Lewis University aviation program. The popularity of the workshop was highlighted by audience comments asking for a more frequent program.

Crowd gathering for the Saturday workshop.

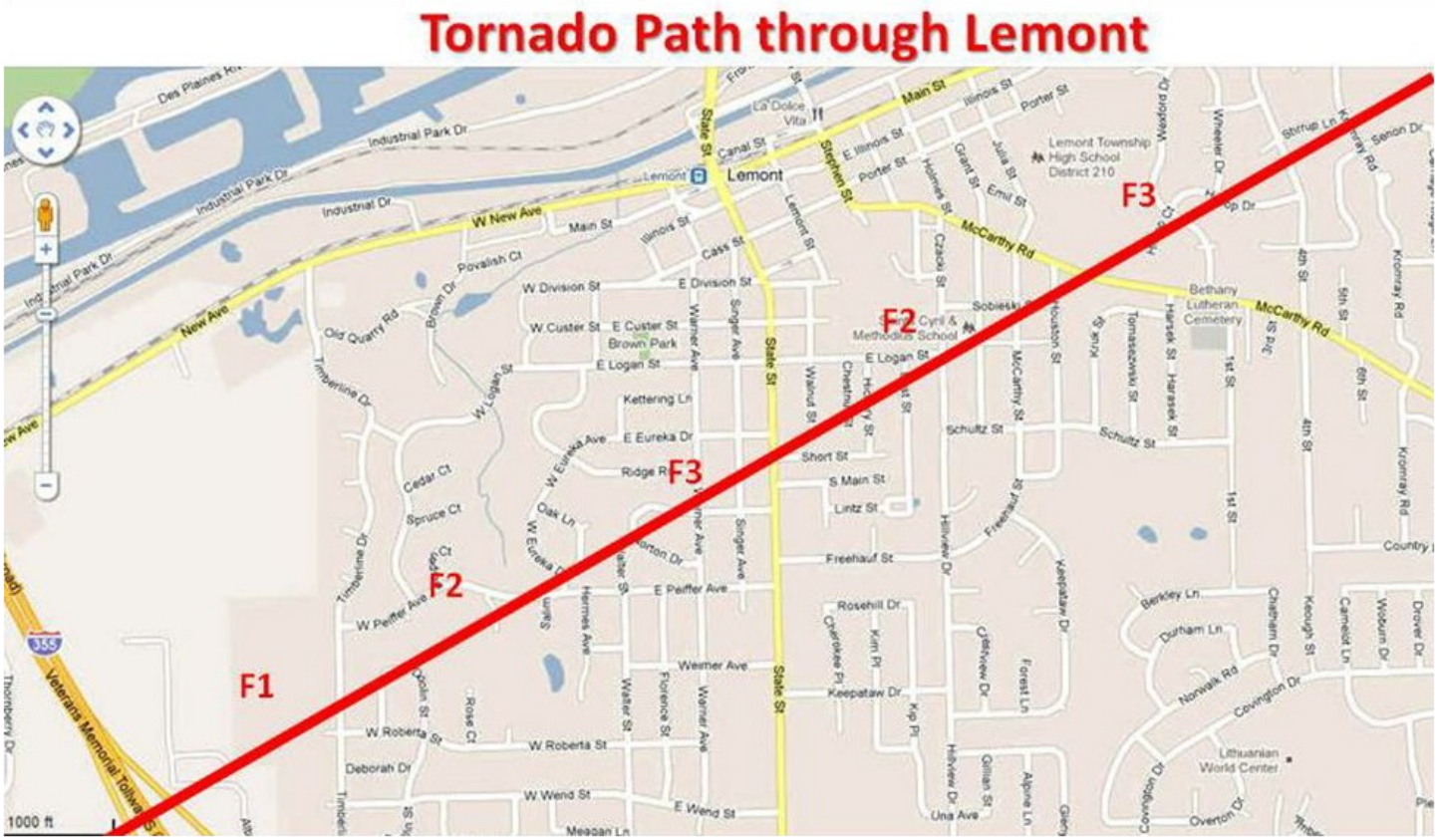
F3 Tornado Ripped Through Lemont 20 Years Ago

By Jim Allsopp, Warning Coordination Meteorologist

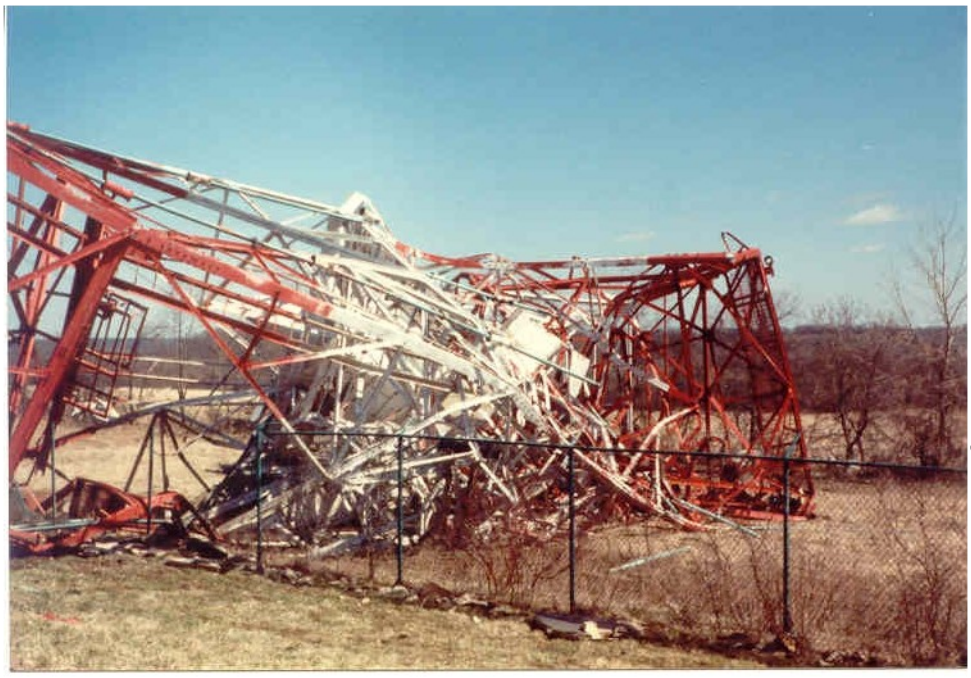
On March 27, 1991 severe thunderstorms produced hail, damaging winds, and tornadoes across northeast Illinois and northwest Indiana. The most intense tornado ripped a 16 mile path of destruction from Romeoville through Lemont to near Willow Springs, and was rated F3 on the Fujita Scale.



Map of tornado damage path



The funnel cloud was first sighted by spotters from Plainfield and the west side of Joliet as it approached Romeoville. The first signs of minor wind damage were near Weber Road, where shingles and TV antennas were blown off houses. The tornado touched down at the Romeoville High School athletic field where bleachers, a press box, and concession stand were damaged. The tornado continued to produce sporadic light damage as it passed the Citgo refinery and ComEd power plant at 135th Street and the Des Plaines River. The tornado intensified east of the river. A two story house was unroofed at 127th Street and Smith Road, and a 263 foot microwave tower was taken down.



Collapsed microwave tower near 127th and Smith Road – photo by Jim Allsopp

House unroofed near 127th Street and Smith Road – photo by Jim Allsopp

The tornado intensified further as it moved into Lemont, reaching F3 intensity along Pfeiffer Avenue, west of State Street. Several homes suffered severe damage with entire roofs removed, exterior walls taken down and garages demolished. The width of the damage path was about 200 yards. The tornado continued east of State Street to near McCarthy Road and Houston Street, where house roofs and garages were damaged. A house on McCarthy Road was pushed off its foundation. The tornado then struck McCarthy Pointe, a subdivision of new homes. The most intense damage occurred in this area. Two homes were almost completely leveled and several more homes were severely damaged. The tornado then struck the Mother Theresa Home near Main Street and Walker Road, damaging several structures and trees.

The tornado weakened as it moved east along Main Street, causing damage to trees, power lines and industrial buildings. The tornado struck a church near Route 83 and finally dissipated in the Cook County Forest Preserve along Archer Avenue, east of Route 83. The funnel cloud was later observed over Burbank and Midway Airport, but no further damage occurred.

Damage near Peiffer and Warner Roads – photo courtesy Lemont Historical Society

More than 100 homes were damaged or destroyed and seven people were injured. The tornado rocked a Lemont police car west of town. Sergeant Tom Hess radioed in to sound the sirens, which may have saved lives in Lemont.

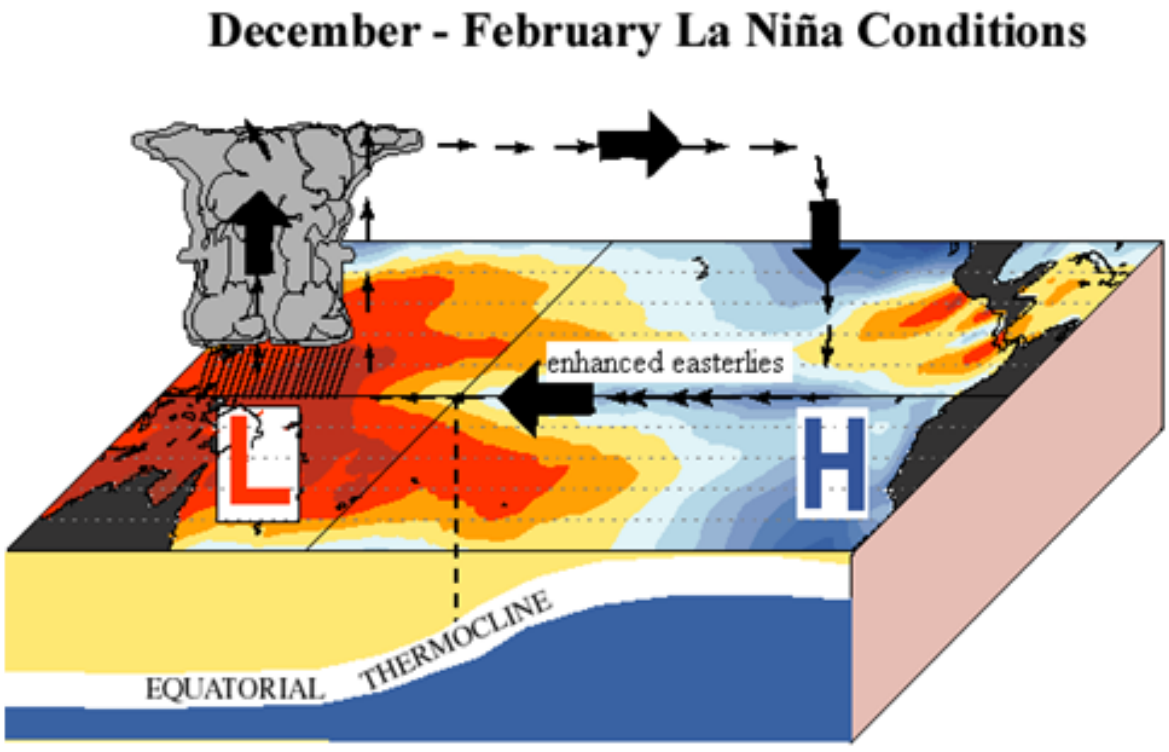
Other weaker tornadoes were reported southwest of Naperville in Will County, near Monee in Will County, and in Kankakee County. Thunderstorm winds flipped over several planes at Palwaukee Airport in Wheeling, and an 85 mph wind gust struck O'Hare Airport, blowing out car windows, and damaging billboards, signs and power poles. Golf ball size hail fell at Lake Station and near Gary in northwest Indiana.

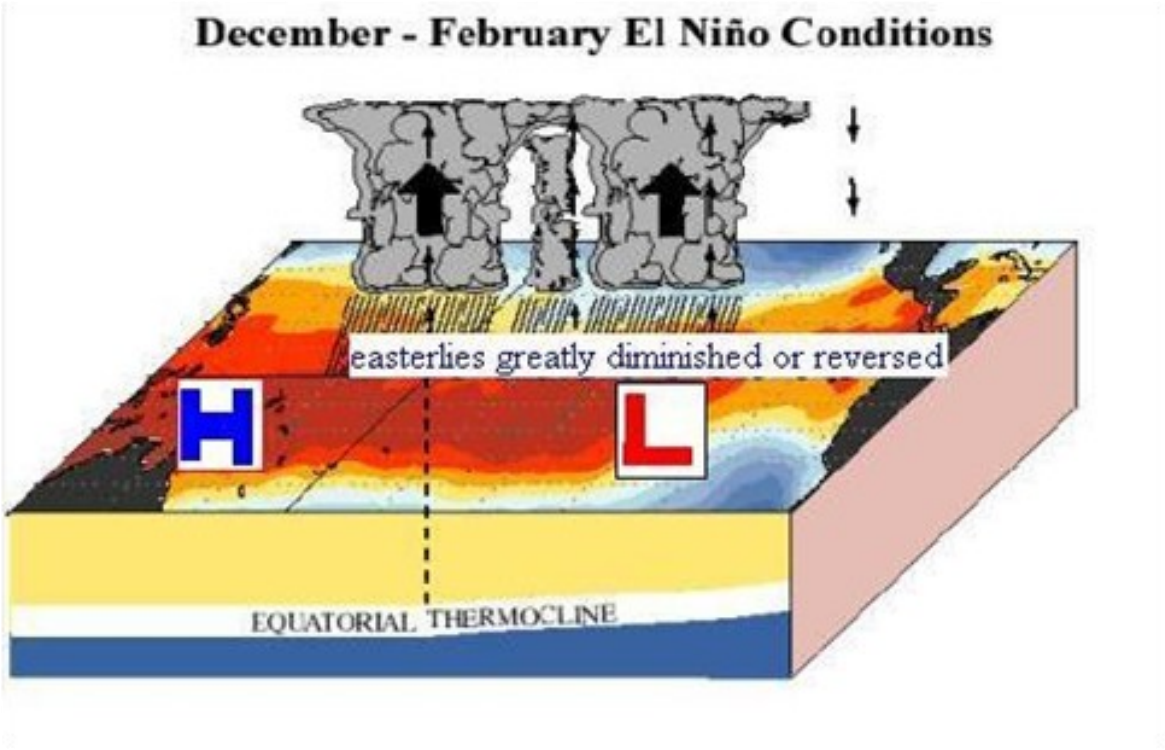
This was one of the earliest tornadoes of the season to reach F3 intensity in the Chicago metro area. The only others were the EF3 tornado in Boone and McHenry Counties January 7, 2008, and three tornadoes on March 12, 1976 (the day President Ford's motorcade was rolling through Chicago). One F3 tornado caused damage from Oswego to Villa Park and another struck Northlake and Wilmette. The F4 tornado occurred in northwest Indiana from near Deep River to Michigan City.

This is a reminder that northern Illinois and northwest Indiana are vulnerable to strong and violent tornadoes, and the tornado season is upon us. Review your severe weather preparedness plans for work, home, and school. Have a method to receive the warning, have designated tornado shelter, and a safety kit.

La Niña Spring 2011 Severe Weather and Tornado Impacts

By **Kevin Birk, Forecaster and Richard Castro, Meteorologist Intern**

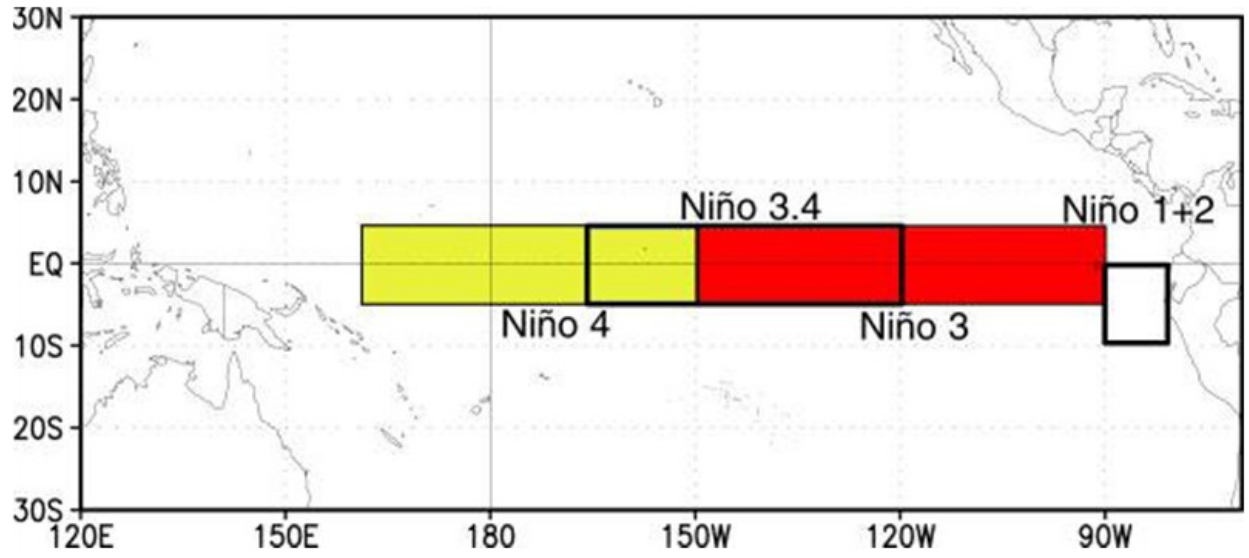




La Niña Overview

La Niña conditions remain in place across the equatorial Pacific as of mid-March 2011. La Niña is the opposite of El Niño. These two events are the negative (La Niña) and the positive (El Niño) extremes to a naturally occurring phenomena known as the El Niño Southern Oscillation (ENSO). The defining characteristics are Sea Surface Temperature (SST) anomalies (departures from average) across the central and eastern equatorial Pacific. During La Niña conditions, cooler than average SST's are found along the equator in the central and eastern Pacific region (image on previous page). Just the opposite occurs during El Niño events (image above).

The importance of these SST anomalies lies in the fact that they largely dictate where tropical thunderstorms will develop and be most persistent. During La Niña events, the warmest ocean waters are confined to the western equatorial Pacific region. Therefore, this is the preferred placement for tropical thunderstorms during the Northern Hemisphere cold season. These thunderstorms can be considered as a "bridge" between the ocean and the atmosphere. As these thunderstorms develop, they induce low pressure within the western Pacific region, while high pressure sets up across the eastern equatorial Pacific where thunderstorms are less favorable (Right hand figure above). This leads to stronger easterly trade winds (flow from high to low pressure). In return, these stronger trade winds help reinforce the SST pattern by pushing the warm water west and enhancing the strength of the cool eastern Pacific water. It is this process that produces significant changes to the atmospheric circulation in the tropics and also throughout much of the Northern Hemisphere.



The figure above shows several corridors across the central and eastern equatorial Pacific. SST's are monitored within these regions. The area labeled as Niño 3.4, which runs from 170° W to 120° W, is used to determine the presence and strength of a La Niña event. If the three month running monthly average ("seasons") SST anomalies, called the Oceanic Niño Index (ONI), are cooler than -0.5°C within this area, La Niña conditions are present. For a La Niña to be considered an official episode, these conditions have to exist for five consecutive three month "seasons". The strength of La Niña is determined by the extent that the anomalies fall below the -0.5°C threshold. For example a moderate La Niña is in place if the anomalies exceed -1.0°C. Similarly, a strong La Niña is defined as anomalies below -1.5°C.

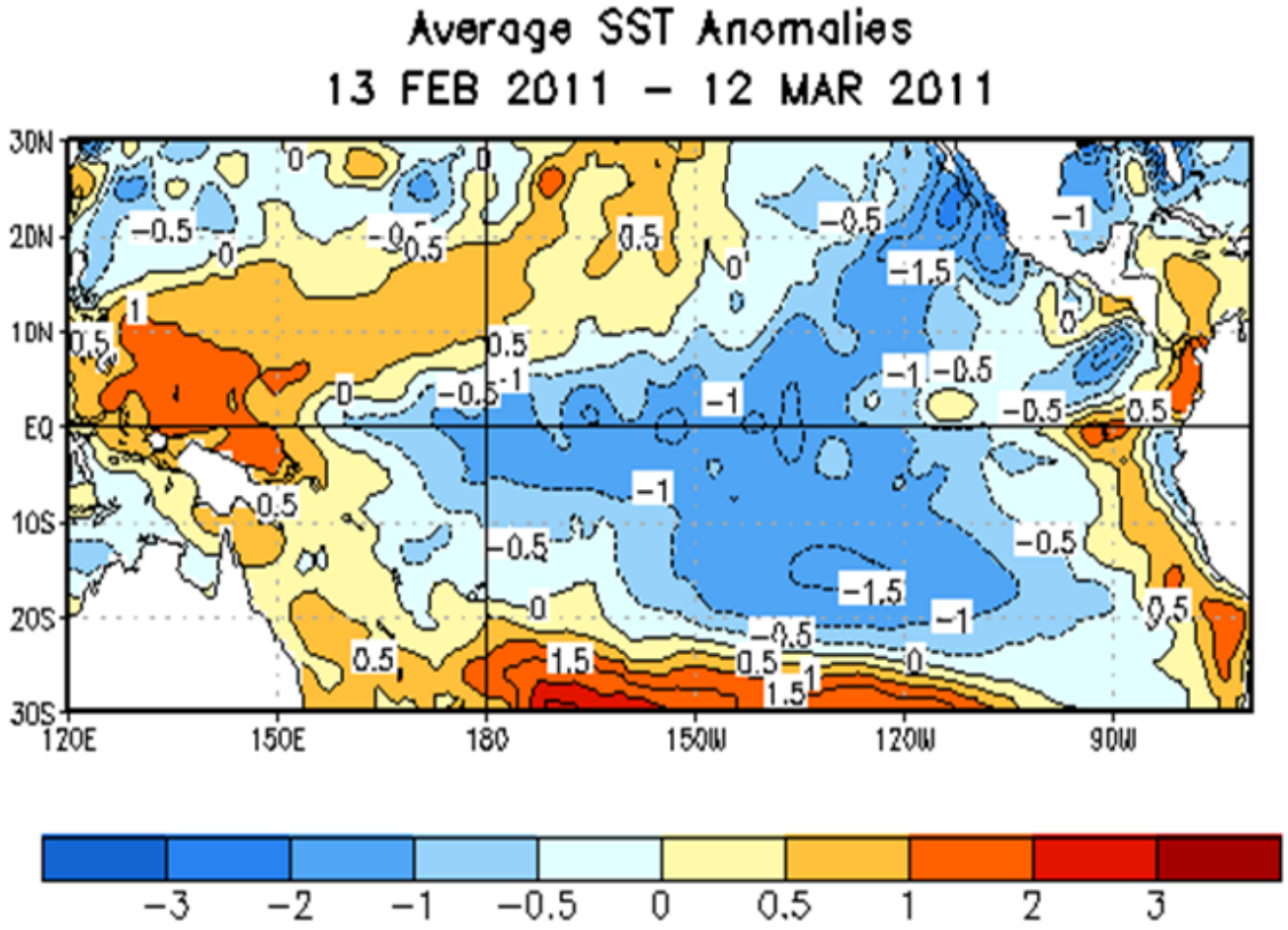
Current Conditions

The stronger an event is, the greater the impact it will usually have on the placement and strength of the cold season storm track across the Northern Hemisphere. Our current La Niña is in the process of weakening. However, during its strongest point, it nearly met the strong threshold, which you can see on the chart below, bottoming out at -1.4°C for 3 consecutive "seasons", before weakening

Historical Pacific warm (red) and cold (blue) episodes based on a threshold of +/- 0.5°C for the Oceanic Nino Index (ONI) [3 month running mean of ERSST.v3b SST anomalies in the Nino 3.4 region (5N-5S, 120-170W)], calculated with respect to the 1971-2000 base period. For historical purposes El Niño and La Niña episodes are defined when the threshold is met for a minimum of 5 consecutive over-lapping seasons.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2007	0.8	0.4	0.1	-0.1	-0.1	-0.1	-0.1	-0.4	-0.7	-1.0	-1.1	-1.3
2008	-1.4	-1.4	-1.1	-0.8	-0.6	-0.4	-0.1	0.0	0.0	0.0	-0.3	-0.6
2009	-0.8	-0.7	-0.5	-0.1	0.2	0.6	0.7	0.8	0.9	1.2	1.5	1.8
2010	1.7	1.5	1.2	0.8	0.3	-0.2	-0.6	-1.0	-1.3	-1.4	-1.4	-1.4
2011	-1.3											

The figure below displays the current monthly average SST anomalies across the equatorial Pacific. The strongest anomalies currently reside across the central portion of the basin, with some weak positive anomalies beginning to emerge across the far eastern portion of the basin, which is indicative of a weakening La Niña event during the Northern Hemisphere spring season. In spite of this weakening trend, the effects of La Niña are expected to continue through meteorological spring, March through May.



Pacific Niño 3.4 SST Outlook

- Nearly all models indicate that La Niña will weaken in the coming months.
- However, note that most of the March-May (MAM) ONI forecasts are still -0.5 C and below, so it is reasonably safe to assume La Niña conditions will impact spring weather patterns
- A majority of models and all three multi-model forecasts indicate ENSO-neutral conditions by May-June-July 2011 (Niño-3.4 SST anomalies between -0.5 C and +0.5 C).

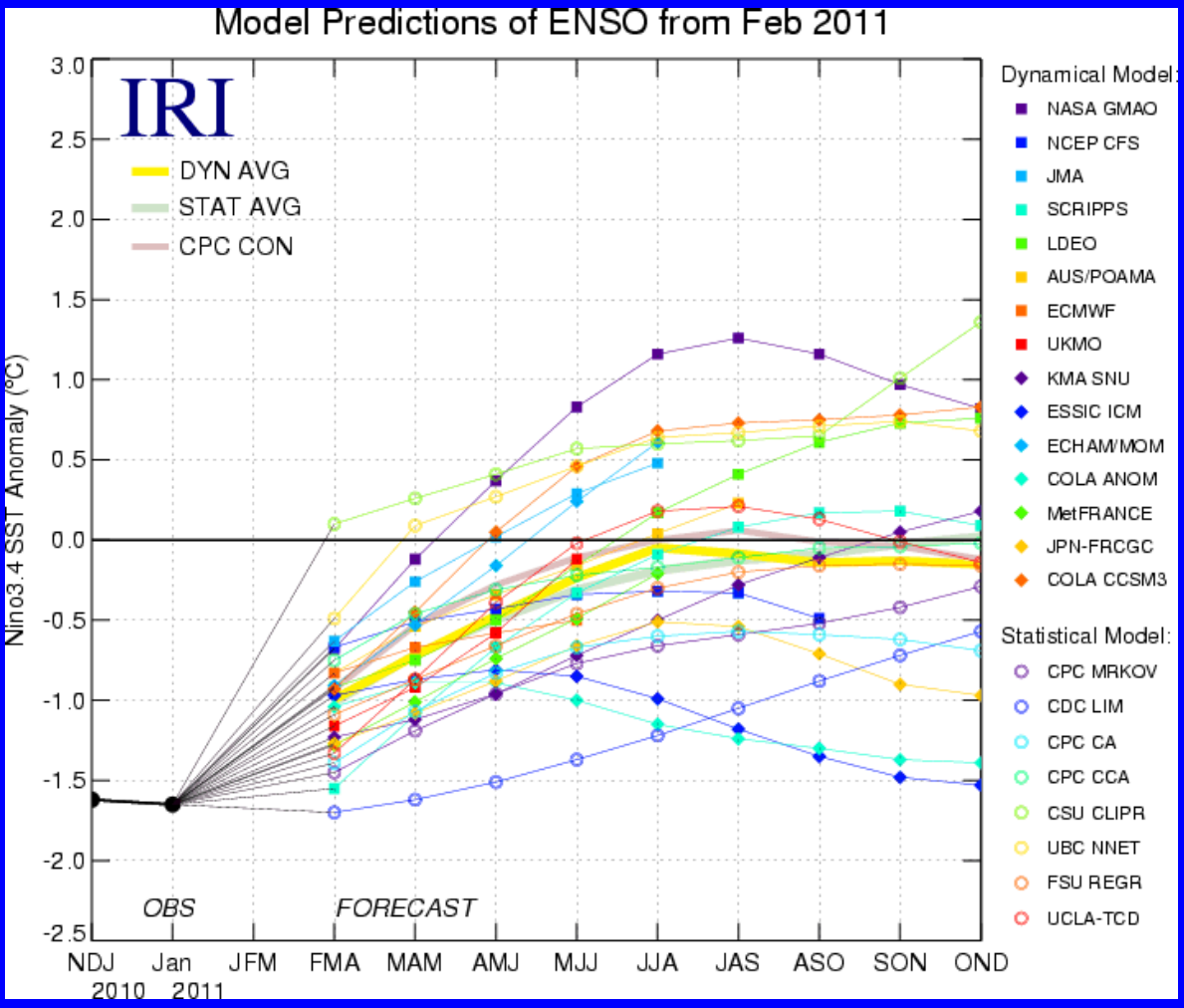
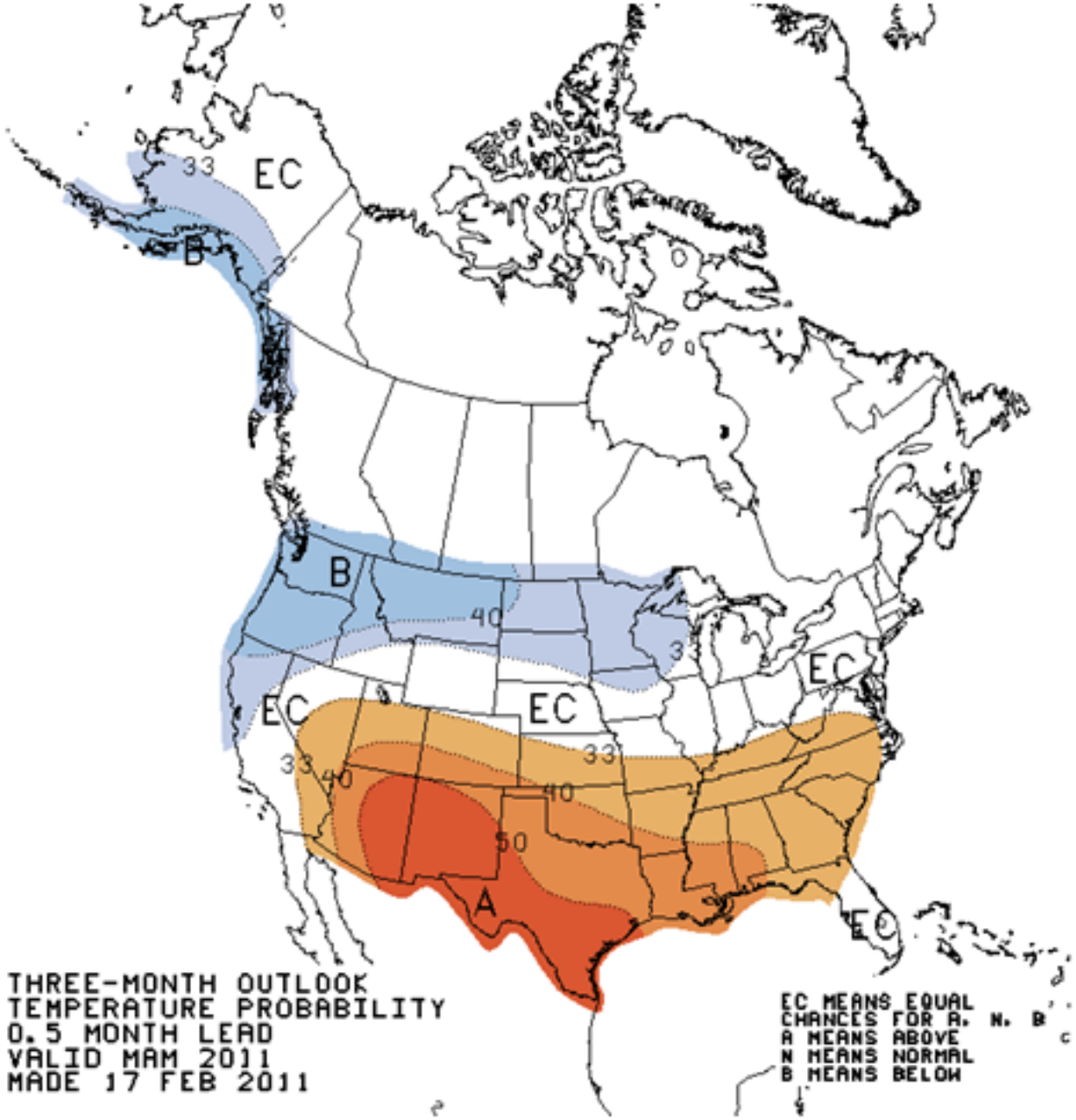
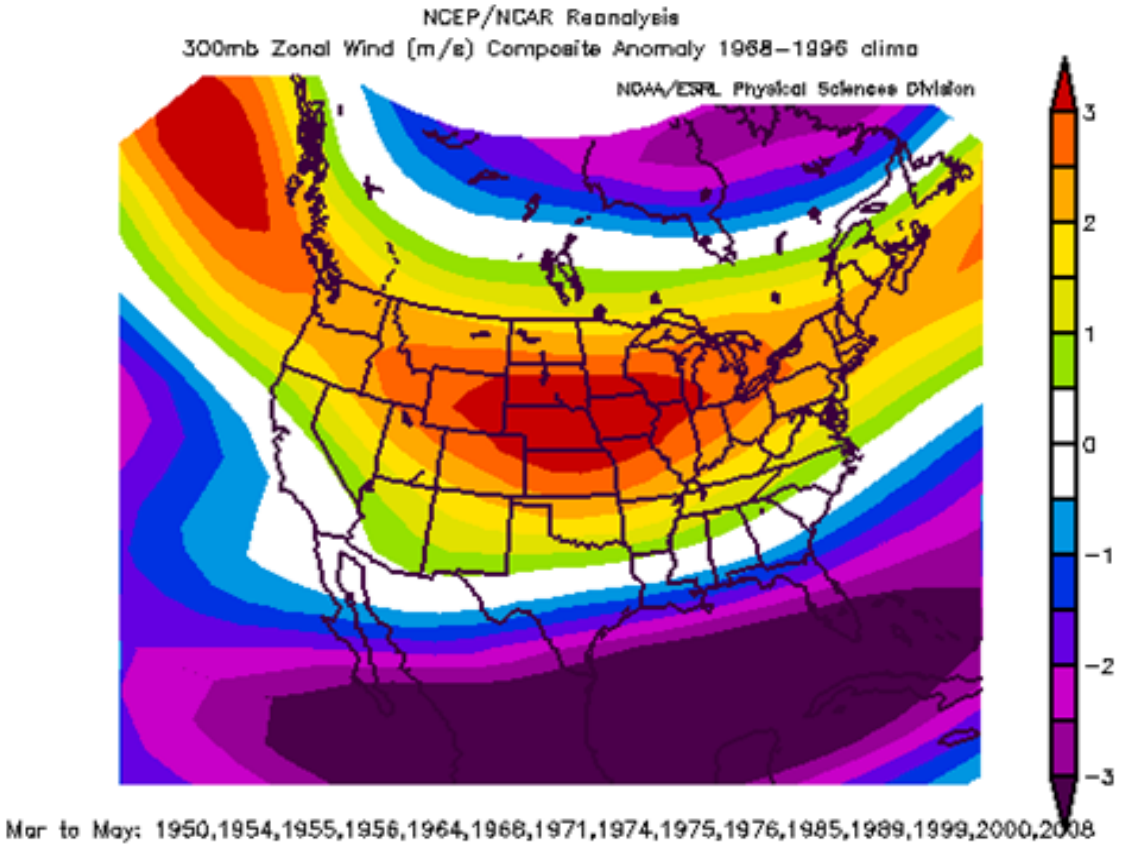


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 15 February 2011).

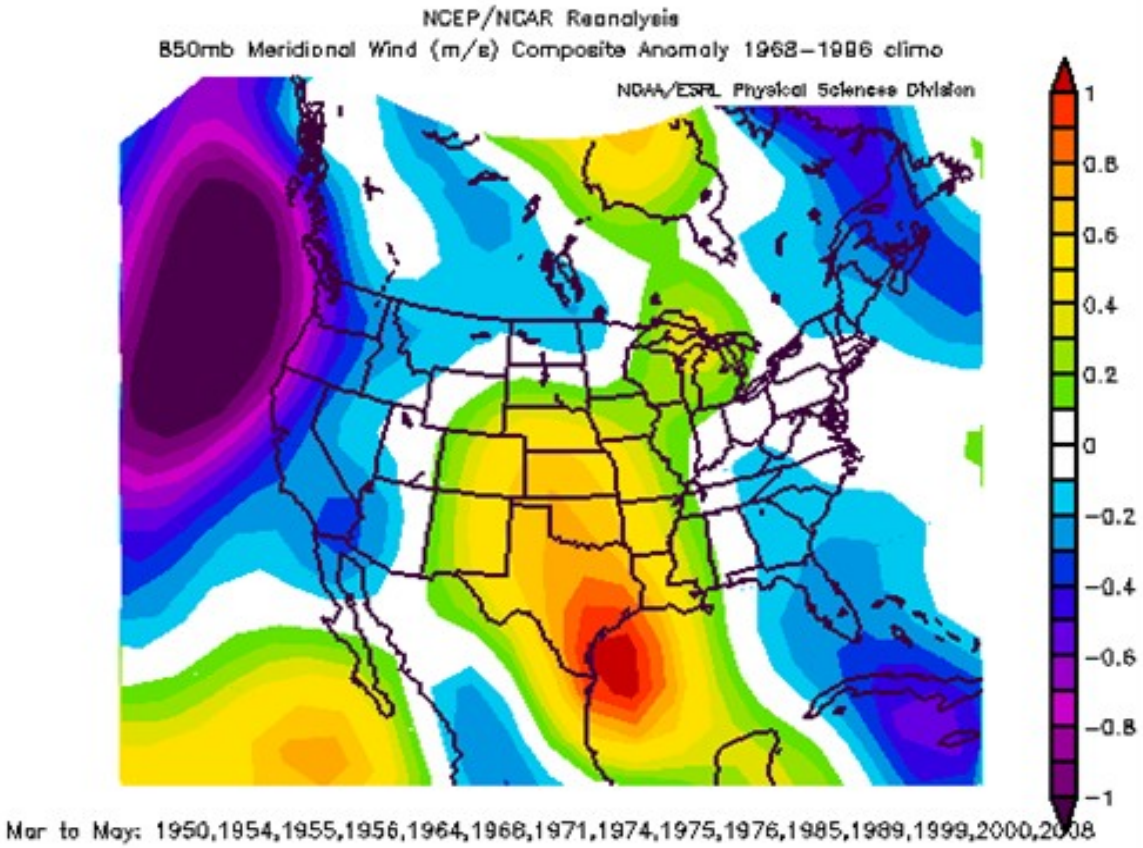
Spring Season Severe Weather and Tornado Impacts

The typical effects from La Niña include high pressure across the North Pacific and the southeastern United States, with low pressure across the northwestern and north central portion of the country. These pressure patterns tend to produce cool conditions across the northern U.S. and warm conditions in the south. The spring season temperature outlook from the Climate Prediction Center (CPC) is shown below, the first figure on the top left, and it illustrates this general pattern. Here in northern Illinois we will be fighting between colder than average conditions in the north and warmth in the south. This temperature contrast is a contributing factor in the recipe for severe weather events. The top figure on the next page displays the zonal wind (winds from west to east) anomalies in the upper levels of the atmosphere (about 35,000 feet). The warm colors across the central U.S. indicate the presence of a stronger than average upper level jet across the region during La Niña spring seasons, which signifies an active storm track, as well as increases the dynamical forcing for severe weather. Similarly, the warm colors in the bottom figure indicate a stronger than average southerly low level jet (about 3,000 feet) across the central U.S. This suggests the tendency for a higher frequency of strong storm systems that will tap into moisture from the Gulf of Mexico.





Mar to May: 1950,1954,1955,1956,1964,1968,1971,1974,1975,1976,1985,1989,1999,2000,2008



Mar to May: 1950,1954,1955,1956,1964,1968,1971,1974,1975,1976,1985,1989,1999,2000,2008

With a strong jet stream typically stretching across the upper Midwest, the enhanced temperature contrast between warmth and cold near our region, and the greater than normal influx of Gulf moisture, there is a threat for more significant severe weather episodes during La Niña springs. Local research has found that this includes an enhanced threat for experiencing significant tornadoes (EF2 or stronger, winds greater than 110 mph, EF, Enhanced Fujita Scale became operational in February 2007) across northern Illinois and northwest Indiana.

The Statistics

From 1950 to 2010, there have been 15 official La Niña springs, 9 official El Niño springs, and 36 what we call "neutral" (SST anomalies between -0.5°C and 0.5°C), leaving us a 60-year dataset. In that time, there were 226 total spring tornadoes (F0 through F5) and 55 significant tornadoes ranked F2 or higher, broken down in table form on the next page by ENSO status. Note that it is likely that monitoring of F0 and F1 tornadoes has improved in recent decades due to the development of previously rural areas and increased overall recognition of severe weather amongst the public (i.e. increased spotter training). Therefore, it is possible some weaker tornadoes that didn't cause any noticeable damage were just not observed in the earlier years of our dataset. However, we can safely assume that monitoring of significant tornadoes has been much more consistent over time due to the much more widespread damage these tornadoes cause.

Official Spring ENSO status (# of years in dataset)	El Niño (9)	La Niña (15)	Neutral (36)
60 years in dataset			
% of years in dataset by official ENSO	15%	25%	60%
226 total tornadoes			
Expected # of out of 226 total spring	34	56	136
Actual # of tornadoes	13	55	158
Actual % of tornadoes	6%	24%	70%
Actual/expected = % of expected	38%	98%	116%
Frequency per Spring season by ENSO	1.4	3.7	4.4
55 total F2+ spring tornadoes			
Expected # out of 55 strong tornadoes	8	14	33
Actual # of F2+ tornadoes	1	20	34
Actual % of F2+ tornadoes	2%	**36%**	62%
Actual/expected = % of expected F2+	13%	**143%**	103%
Frequency F2+ per Spring season by ENSO state	0.1	**1.3**	0.9

It is evident from the table that as expected, La Niña conditions during the spring lead to a greatly elevated threat of significant tornadoes of EF2 or higher (see item highlighted in red on chart), with the overall tornado threat being close to what is expected. Thirty six percent of all significant spring tornadoes occurred in only 15 La Niña springs. Five out of the 15 La Niña springs had significant tornadoes, and 9 of 15 had tornadoes of all intensities reported. Further analysis revealed that the 5 La Niña years with significant tornadoes had even stronger than average upper and lower level jets across the region than the other 10 La Niña events.

In contrast to La Niña events, El Niño events were found to show a relative dearth of tornadic activity. Overall, there was only 13% of the expected number of tornados during these events. A likely reason for this lack of tornadic activity is that El Niño springs, on average, produce much weaker upper and lower level jet streams across the central U.S. Furthermore, low pressure tends to dominate the southeastern United States, promoting cooler than average conditions, while higher pressure and warm conditions dominate across the northern U.S. and Canada. This atmospheric flow pattern is not favorable for significant severe weather.

Neutral years were found to produce a slightly elevated number and percentage of tornadoes of all intensities, but the caveat described above may apply. As an example, in the spring of 2003 and 2004, both neutral ENSO years, 39 total tornadoes were reported between the two seasons. This may have skewed the record, because we have no way of knowing how many weaker tornadoes were missed in the earlier years of the database. The threat from significant tornadoes during neutral ENSO springs was found to be close to the expected number.

There are two “neutral” years in our database that require extra discussion; 1962 and 1967. Both of these years featured multiple significant tornadoes, with 4 in 1962 and 5 in 1967. Any longtime Chicago resident will recognize 1967 as the year of the infamous April 21st tornado outbreak, the worst in the history of the metropolitan area. In fact, the 5 significant tornadoes and the 11 total tornadoes all occurred on that one deadly and destructive day. What is notable about 1962 and 1967 is their respective March through May ONIs, which were both -0.5°C, the minimum threshold for La Niña conditions to be present. However, since there weren’t five consecutive 3-month “seasons” of La Niña conditions, the springs of 1962 and 1967 were not part of official La Niña episodes.

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
1961	-0.2	-0.2	-0.2	-0.1	0.1	0.2	0.0	-0.3	-0.6	-0.6	-0.5	-0.4
1962	-0.4	-0.4	-0.4	-0.5	-0.4	-0.4	-0.3	-0.3	-0.5	-0.6	-0.7	-0.7
1966	1.2	1.0	0.8	0.5	0.2	0.2	0.2	0.0	-0.2	-0.2	-0.3	-0.3
1967	-0.4	-0.4	-0.6	-0.5	-0.3	0.0	0.0	-0.2	-0.4	-0.5	-0.4	-0.5

Interestingly, from the table on the previous page you can see that both 1962 and 1967 coincided with periods that fell just short of reaching official La Niña criteria. It is possible, or even likely, that SST conditions in the tropical Pacific just shy of La Niña status lead to an atmospheric response similar to a very weak La Niña that does reach criteria. The same is probably true for periods that fall just shy of reaching El Niño criteria. Therefore, applying a slightly looser definition to ENSO events, we included these 1962 and 1967 as La Niña springs, and 1953 (MAM ONI 0.5°C) and 1993 (MAM ONI 0.7°C) as El Niño springs and recalculated our results.

Spring ENSO status (# of years) in data-set)	El Niño (11)	La Niña (17)	Neutral (32)
60 years in dataset			
% of years in dataset by official ENSO state	18%	28%	53%
226 total tornadoes			
Expected # of out of 226 total spring	41	64	121
Actual # of tornadoes	15	70	141
Actual % of tornadoes	7%	31%	62%
Actual/expected = % of expected	37%	109%	117%
Frequency per Spring season by ENSO	1.4	4.1	4.4
55 total F2+ spring tornadoes			
Expected # out of 55 strong tornadoes	10	16	29
Actual # of F2+ tornadoes	1	29	25
Actual % of F2+ tornadoes	2%	**53%**	45%
Actual/expected = % of expected F2+	10%	**181%**	86%
Frequency F2+ per Spring season by	0.09	**1.7**	0.8

The results from our strict ENSO definition are already significant, but the results from the looser definition produce strikingly significant results for La Niña springs (see the entries highlighted in red in the table on the previous page). Greater than half of all significant tornadoes now occur in only 17 La Niña spring seasons, a much greater number than what would be expected based off the percentage the La Niña spring seasons comprised in the 60 year database. Total tornado activity was also greater than expected, but still more so for neutral springs. If we were to expand our definition even a bit more, for example including springs that came a month or two after the end of an official ENSO event, we would likely see a continuation of this pattern.

Finally, along with significant tornadoes, the risk for significant severe weather with very large hail is also elevated during La Niña spring seasons. We found that that since 1955, 29% of all 2" or greater hail events occurred during La Niña spring seasons, and these 100 events were 127% of the total we would have expected strictly based off of the percentage of the La Niña spring seasons that comprise the total years in the database.

	El Niño	La Niña	Neutral
Actual # of 2" hail events	66	100	174
% of years in database	18%	23%	59%
Expected # of 2" hail events	61	79	200
Actual % of 2" hail events	19%	29%	51%
Actual/expected= % of expected 2"	108%	127%	87%

In conclusion, it appears that during the spring of 2011 there will be an increased threat for severe weather across northern Illinois, including tornados. However, this does not mean there will in fact be a large number of significant tornadoes that will affect the area. Severe weather is not atypical during the spring across northern Illinois and northwestern Indiana. The results of this study are meant to simply show that there is an enhanced chance of experiencing more severe weather events than during a typical spring season. Many ingredients have to come together to produce a severe weather episode. La Nina conditions simply produce a large scale atmospheric flow pattern across the U.S. that is more favorable for producing severe weather across the central U.S. However, many smaller scale atmospheric patterns come into play and they help to dictate the placement and timing of severe weather events.

Northerly Island to Get An Upgrade to the Weather Equipment and an Expansion of Types of Data.

By Bill Nelson, Observation Program Leader

The lone piece of weather equipment currently in use by the National Weather Service (NWS) on Northerly Island, formerly known as Meigs Field, is an automatic temperature/dew point unit. The data from the unit is sent to the NWS's Chicago Forecast Office in Romeoville. From there, it is disseminated to the public and media. This unit will soon be replaced by a more extensive package of instrumentation.

First, a little about Meigs Field

Merrill C. Meigs Field Airport was a single strip airport that operated from December 1948 until March 2003. It was built on Northerly Island, the man-made peninsula that was also the site of the 1933–1934 "Century of Progress" in Chicago.

Northerly Island, a 91- acre peninsula that juts into Lake Michigan and owned by the Chicago Park District, is the only lakefront structure to be built based on Daniel Burnham's 1909 "Plan Of Chicago". It is located just south of the Adler Planetarium and east of Soldier Field.

- December 10, 1948, airport opened and became the country's busiest single-strip airport by 1955.
- June 30, 1950, the airfield was named for Merrill C. Meigs, publisher of the *Chicago Herald and Examiner* and an aviation booster.
- 1952 -The air traffic control tower was built – in the mid 50s weather equipment was installed to take the necessary elements of a weather observation which included, temperature, dew point, wind direction and speed, pressure, and cloud height.
- 1961 -The terminal was dedicated.
- 1970s Meigs Field became a critical facility for aero-medical transport of patients and transplant organs to downtown.
- Late 1980s -Meigs Field commuter airline service to the public peaked.
- Early 1990s, the Chicago-area Tuskegee Airmen, Inc. provided free airplane rides every month and aviation education to Chicago youth at Meigs Field. Thousands of children took their first airplane rides there until 2003
- October 15, 1992 a Boeing 727 that was donated from United Airlines to the Chicago Museum of Science and Industry made its final landing at Meigs, on its way to be transported to the museum to become an exhibit.
- Late 1990s, the charting of two FAA instrument approaches allowed for landings in poor weather conditions.

- The runway at Meigs Field was nearly 3,900 by 150 ft (1,200 by 46 m). In addition, there were four public helicopter pads at the south end of the runway, near McCormick Place.
- March 31, 2003 – The airport was closed when large X-shaped gouges were bulldozed into the runway surface. The mayor stated that safety concerns required the closure due to the post-September 11 risk of terrorist-controlled aircraft attacking the downtown waterfront near Meigs Field.
- By August 2003, construction crews had finished the demolition of Meigs Field. Northerly Island is now a park that features prairie grasses and strolling paths. All weather equipment, except the temperature/dew point unit, had been removed by FAA and NWS personnel.
- April 12 2005 – Northerly Island officially becomes an official NWS Cooperative site so that the temperature data can be preserved.
- In June 2005, the 7,500 seat Charter One Pavilion opened, which hosts music concerts in the summer.
- March 2007 – Recognizing that the current temperature/dew point unit will become obsolete and spare parts scarce, the NWS begins the process of obtaining replacement equipment and negotiating with the city of Chicago for a new location on Northerly Island.
- February 2011, the city of Chicago signs a lease allowing for the new weather equipment to be installed at a previously surveyed location.
- NWS gave final approval of the types of sensors to be included in weather station and the necessary funding.
- Elements to be taken are: Temperature/ dew point; wind direction and speed; pressure; rainfall
- Summer 2011 – Installation of new weather instrumentation on Northerly Island is scheduled to be completed.

Some of the above data is from Wikipedia, the free encyclopedia, and the Chicago Park District

Chicago downtown/lakefront temperatures have been carried in public service reports and used in NWS forecasts for Chicago for 50 plus years. The original site was at Grant Park and the reports are of historical significance to the millions of residents. Chicago media have commented that lakeshore readings are one of the most important pieces of information they can have to provide their viewers and listeners.

The current Lakefront observations are used by forecasters to create forecasts and warnings for the downtown area of the City of Chicago. Temperature and dew point measurements (to calculate relative humidity) are also essential data for NWS and for the City of Chicago Office of Emergency Management and Communications (OEMC) for Heat Warning services. The city utilizes this data for critical decision making in determining the need for the opening of cooling centers and other.

The additional data coming from the new equipment will enhance the weather information provided, and expand the forecast process:

- Wind data would provide NWS Chicago with high impact one minute wind information that it requires to better support aviation weather forecast services to the two major airports in Chicago (Midway and O'Hare). The wind information will also provide valuable information to the public forecaster for the heat warning services in the urban core.

- Rainfall - Real-time rainfall data would be used for flash flood monitoring and warning, and useful in calculating mean areal basin precipitation for the river forecast program. With a highly urban area like Chicago, it takes as little as 1 inch of rain in an hour to cause flash flooding or urban flooding problems. This data is also used by the River Forecast Center.

The current temperature/dew point sensor unit.

Temperature/dew point readout unit in the NWS office

The new weather station will look similar to this and able to take Temperature/ dew point; wind direction and speed; pressure; rainfall data